

## Economic Success from CHP

Combined heat and power (CHP) systems allow for the efficient production of electricity and thermal energy from a single source. Compared to the overall efficiency of a conventional generation system with separate heat and utility power, CHP applications are typically around 25% more efficient, and offer improved reliability and resiliency for end user operations. The increased efficiency and enhanced resilience of CHP systems offers significant financial savings opportunities and economic benefits to a variety of facility and application types. In addition to energy cost savings, CHP systems can lead to facility expansions and increased end-user revenue and productivity, job creation, and economic benefits for surrounding communities. This fact sheet provides an in-depth look at the multitude of benefits that CHP can offer through a number of successful examples.



## Energy Cost Savings

CHP can provide electricity and thermal energy at a much lower cost to end users compared to grid electricity coupled with an onsite boiler. With CHP, facilities can efficiently produce their own electricity and offset retail electricity costs. Thermal energy from the generation process can be recovered and utilized, eliminating the need for boiler fuel purchases. Additionally, high-volume fuel purchases for CHP can often be obtained at a lower rate than previously purchased boiler fuel.

The Cox Interior manufacturing facility in Campbellsville, Kentucky is a noteworthy example of achieving significant energy cost savings with CHP. The wood waste created on-site from trimming doors, molding, and stair parts is collected and incinerated in a boiler that powers the facility with a steam turbine while producing additional steam for wood drying kilns. Many industrial manufacturing facilities produce waste products that can be utilized as an inexpensive fuel source for CHP while reducing waste and conserving resources. At Cox Interior, electricity is generated at 5-6 cents per kWh, while the cost to purchase electricity from the utility is 11 cents per kWh, offering considerable energy cost savings for the facility. The wood drying kilns that use CHP-produced steam enable Cox to purchase low-cost green lumber and dry it on-site.

### CHP Energy Cost Savings

*Frito-Lay Plant, Killingly, CT*

- 4.6 MW system, \$1 million annual savings

*Arcelor Mittal Steel Mill, East Chicago, IN*

- 38 MW system, \$20 million annual savings

*O'Hair Shutters, Lubbock, TX*

- 1.5 MW system, \$480,000 annual savings

*Caterpillar Aurora, Aurora, IL*

- 15 MW system, \$2 million annual savings

*Crave Brothers Farm, Waterloo, WI*

- 633 kW system, \$300,000 annual savings

*F-D-S Manufacturing Co., Pomona, CA*

- 390 kW, \$420,000 annual savings

*"[The CHP system] fulfills many beneficial needs...It's absolutely a major benefit, and I don't think the company could do without it and be as economically stable as we are today."*

**– Ruth Logsdon, Environmental Director, Cox Interior**

Similar projects have also provided significant energy cost savings benefits to other CHP end users. The savings that these projects provide allow end users to improve and/or expand facility operations, become more competitive, and increase the number of local jobs, providing broader community-scale benefits. When companies save money on energy they can focus these financial resources on core business activities including process improvements or expansions.

## Facility Expansions and Increased Productivity with CHP

The energy cost savings that CHP systems provide, along with the increased electric and thermal reliability, allow facilities to invest in other areas of their business. Facilities and operations of all types and sizes are realizing the business case for CHP as it relates to future growth. The examples below illustrate that no matter the type or size of facility, CHP can provide benefits essential to the core business.

***Clover Hill Dairy's (WI)*** CHP success allowed the farm to expand from 1,250 to 2,000 cattle, double the size of their digester, and install 180 kW of new CHP generation



Source: Clover Hill Dairy

***Freres Lumber (OR)*** was able to introduce two new revenue streams to its business with the CHP system: \$2.5 million/year in power sales and \$100,000/year based on renewable energy credit (REC) sales



Source: Freres Lumber

***POET Biorefining (MO)*** was able to avoid numerous electric grid outages over ten years by operating the CHP system independent of the electric grid, resulting in no lost productivity or capacity at the refining facility



Source: Ethanol Producer Magazine

*"The installation of the CHP cogeneration system at our Fitchburg, MA plant has changed our competitive cost position dramatically enabling the company to retain energy intensive manufacturing operations and to consider adding new operations in the future."*

– Ray Martino, President and CEO, Simonds International, a cutting tool manufacturer

## Jobs Impact of CHP

The installation of a CHP system can lead to the creation of primary and secondary jobs. Primary jobs consist of employment impacts related to the manufacturing, installation or ongoing operations of CHP equipment. Secondary jobs include impacts seen in the CHP supply chain and other supporting industries. In addition, the increased productivity and reliability from CHP can keep facility operations competitive, allowing companies with CHP to retain their current workforce. Below are three examples of the jobs-related impact that CHP has had for a variety of facilities and applications.

### Struthers Water Pollution Control Facility

- Wastewater treatment facility located in Struthers, Ohio
- Facility treats **~4.5 million gallons/day** of wastewater, serving **25,000 people**
- **1 MW CHP system** provides ~70% of facility power and thermal needs
- Energy cost savings of **\$300,000/year**
- **30-40 jobs** created through system design, installation and related activities

### Gunderson Health System

- Not-for-profit healthcare system serving western Wisconsin
- **1.1 MW CHP system** provides hot water and space heating to entire campus
- Electricity sold to Xcel Energy generates **\$500,000/year** in revenue
- Savings and revenue generated from CHP has ensured permanent employment for roughly **6,000 hospital staff members**

### Arcelor Mittal Steel Mill

- Indiana Harbor Steel Mill of Arcelor Mittal located in East Chicago, Indiana
- Facility employs **6,000 permanent** workers
- **38 MW CHP system** provides 330 GWh of electricity and 350,000 lbs steam/hour
- Energy cost savings of **\$20 million/year**
- **360 primary and secondary jobs** created through manufacturing and construction from local suppliers

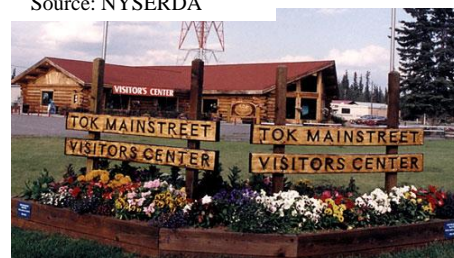
## Community Benefits from CHP

In addition to the positive direct impacts that CHP systems can have for end users, there can also be a number of secondary benefits for the surrounding community. By increasing industrial productivity and introducing secondary businesses to the community, CHP systems can have a broad range of community-scale benefits, as shown in the examples below.

- Tenants of ***Roosevelt Landings***, a 1,003 unit mixed income apartment complex in New York City, realized cost savings from the installation of a 300 kW CHP system in 2014. This resulted in more affordable apartments and reduced operating costs over the long term for the complex. In addition to these cost savings, the CHP system reduces over 1,600 tons of CO<sub>2</sub> annually.
- The ***Village of Tok, Alaska*** installed a 120 kW CHP system powered by biomass from a local forest to decrease energy costs for its residents. The CHP system allowed for job creation in food production and greenhouse operation, which then led to local economy and infrastructure investments through agriculture program partnerships with the University of Alaska.



Source: NYSERDA



Source: U.S. DOE

CHP is a proven, reliable, cost-effective way of providing energy services for the manufacturing, commercial and institutional sectors. CHP improves energy efficiency, operational reliability and resiliency, and reduces the energy cost per unit of product. Various studies have shown that CHP, deployed as part of a comprehensive energy efficiency strategy, can have significant positive economic impacts including the creation of “green-collar” jobs. In the United States, where labor and raw materials costs can be high, improving energy efficiency can mean the difference between remaining in business, moving offshore, or closing altogether. CHP has been shown to improve the financial competitiveness of a company just as much as other conventional measures to eliminate waste and increase production output.

A recently completed CHP system located at an industrial paper mill in Florida offers an outstanding example of the full range of economic benefits a CHP system can offer. The Eight Flags Energy and Rayonier Advanced Materials success story is summarized in the case study on the next page.

## Conclusion

Facility owners facing high energy bills should consider CHP as an economically viable method to improve their operations through increased productivity and energy cost savings. The Department of Energy’s CHP Technical Assistance Partnerships can help with site screenings, and other forms of technical assistance throughout the analysis, CHP procurement, and commissioning process.



### **Eight Flags Energy and Rayonier Advanced Materials**

Florida Public Utilities (FPU) created a subsidiary, Eight Flags Energy, to build, own, and operate a 21.7 MW CHP system on Amelia Island, Florida. The CHP system, which became operational in June 2016, is a source of baseload grid electricity for approximately 16,000 FPU customers, and supplies steam and heated water for Rayonier Advanced Materials, a large paper mill. The plant produces 160,000 metric tons of softwood cellulose specialties per year and employs more than 300 people. It contributes to Florida's economy by providing \$35 million annually through wages and salaries, while annually paying \$2 million in property and sales taxes.

**Energy Cost Savings:** Generating electricity using the CHP system at the Eight Flags facility reducing energy costs by over 10% relative to other utility sources. Energy cost savings are expected to be more than \$28 million over the 20-year lifetime of the project, savings which will be passed on to ratepayers.

**Facility Expansion and Increased Productivity:** The increased steam capacity and electric reliability at the Rayonier facility has increased mill production by the equivalent of 5-7 days/year, providing additional revenue for the company. This increase in production and revenue allowed Rayonier to pursue a \$125 million facility expansion, resulting in enhanced profitability and production for future operations.

**Job Creation:** During construction, approximately 100 jobs were created for the design, construction, and installation of the system. Additionally, the increased efficiency and reliability in operations led to more revenue for the Rayonier facility. This enabled the expansion at the site, expected to be completed in the spring of 2018, creating approximately fifty permanent employment opportunities for manufacturing workers.

**Community Benefits:** Construction and installation of the Eight Flags CHP system, as well as the increase in production at the Rayonier facility, allowed for an increase in the local property tax base of \$800,000 for Nassau County, home to more than 75,000 people. The system can also operate as an isolated microgrid that is designed to handle a class 3 storm surge and support critical infrastructure facilities (hospital, fire, police) on the island following a storm.

**Energy Resilience:** The Eight Flags CHP plant quickly restored power after the passage of both Hurricane Matthew in 2016 and Irma in 2017. This increased energy resilience helped bring electricity back for many Amelia Island customers and allowed the Rayonier mill to avoid greater losses in production and return to normal operations using the steam from the CHP system.

